6. Lodgepole Pine Ecological Series

Table 06-1. Full and short names for the ecological types in the Lodgepole Pine Ecological Series.			
Ecological Type Code	**Name**	**Plant Association Code**	**Short Name**
FD17	Lodgepole pine/silvertop sedge–Cold Cryoboralfs–Glacial granitic slopes, 9,900-10,800 ft	PICO/CAFO3	Lodgepole pine/silvertop sedge—Cold light-colored soils—Glacial
FD18	Lodgepole pine/Rocky Mountain whortleberry–Cryoboralfs–Gentle to moderately steep slopes, 9,300-10,600 ft	PICO/VAMYO	Lodgepole pine/whortleberry—Cold light-colored soils
FD19	Lodgepole pine/sparse—Cryoboralfs-Slopes	PICO/sparse	Lodgepole pine/sparse

This Series comprises mostly pure stands of *Pinus contorta* in which no other species appears to be the potential climax (Pfister and others 1977, Steele and others 1981-1983, also see Mauk and Henderson 1984, Volland 1985). This is the same *Pinus contorta* Series described by Hoffman and Alexander (1976), Pfister and others (1977), Hess (1981-1986), Steele and others (1981-1983), Hess and Wasser (1982), Mauk and Henderson (1984), Alexander (1986-1988), Komárková (1986-1988), and Cooper and others (1987). Sites are often large and isodiametric in shape.

Vegetation, Soils, Climate

Lodgepole pine reaches the southernmost extension of its range at about the middle of the UGB, so lodgepole pine is uncommon in the southern half of the UGB, and is absent from the native flora of New Mexico (Moir 1993). The geographical distributions of lodgepole pine and grouse whortleberry (*Vaccinium scoparium*) closely overlap in the central and southern Rocky Mountains.

Most lodgepole pine climax stands in the UGB are in the Subalpine; stands of lodgepole pine in the Montane are more likely to be seral to Douglas-fir. Stands once called "lodgepole pine/kinnikinnick" and "lodgepole pine/common juniper" are actually Douglas-fir/ kinnikinnick stands from which the seed source for Douglas-fir has been removed by persistent and/or intense fires in past centuries. Some stands may be the Douglas-fir/serviceberry type which, in addition to severe fires, have had the palatable shrub serviceberry removed by heavy browsing.

Most plant associations in this Series could be described as *edaphic climaxes*, where very dry soil and a cold micro-climate prevent trees other than lodgepole pine from growing. Hess and Alexander (1986) described such sites where "*Pinus contorta* is a climax, or at least a long-lived subclimax, species in certain topo-edaphic situations, especially on cold sites with thin, excessively drained soils" (also see Moir 1969 and Despain 1983).

Stands of "lodgepole pine/buffaloberry" can be found as a *disclimax* within the Douglas-fir/buffaloberry type. Stands called "lodgepole pine/elk sedge" are another *disclimax* within either the spruce-fir/elk sedge or the Douglas-fir/elk sedge ecological types.

Table 06-2. Climate and Soils		
Characteristic	**Value**	**Reference**
Precipitation zone	590 mm/yr (410-900 mm/yr) 23 in/yr (16-35 in/yr)	Steele and others 1983, Knight and others 1985
Depth of litter <3 cm diameter in undisturbed PICO Forests	average 2.6 cm	DeByle 1980
Weight of litter <3 cm diameter in undisturbed PICO forests	average 30,000-40,000 kg/ha	
Soil pH to 15 cm depth	5.2 (4.5-6.3)	

Most pure stands of lodgepole pine in the UGB which lack other conifers are found on very coarse, excessively well-drained soils, and often on steep slopes. Some sites are residual, with the soil formed in place, but some are on glacial deposits in or just above valley bottoms, where cold air drainage is common (see Steele and others 1981-1983, Cooper and others 1987, Brulisauer and others 1996). In many pure lodgepole pine stands, cones are non-serotinous, indicating they are unlikely to be maintained by frequent fire (Steele and others 1983).

In many areas, older lodgepole pine trees are susceptible to attack by the mountain pine beetle, *Dendroctonus ponderosae* (see Mauk and Henderson 1984, Cole and Koch 1995). This insect has not yet reached epidemic proportions in the UGB. A photographic guide for identifying mountain pine beetle infestation from aerial photographs is given in Dillman and White (1982).

In northern Utah, northwestern Colorado, and southwestern Colorado, lodgepole pine stands are often infested with dwarf mistletoe (*Arceuthobium americanum*), aggravated in part by the high-grading timber practices of previous generations (Mauk and Henderson 1984, Zimmerman and Laven 1984). Dwarf mistletoe is not very common in the UGB, probably because of the cold climate. Dwarf mistletoe infestation is inversely correlated with fire frequency, so continued protection of lodgepole pine stands from fire will increase the risk of serious damage by dwarf mistletoe (Zimmerman and Laven 1984).

Growing-season evapotranspiration averages 73% of total annual precipitation. The soil is by far the leading storage compartment for water in these ecosystems (Knight and others 1985). Nutrient retention in individual stands depends more on high values of leaf area than on other factors, such as biomass accumulation (Gary and Troendle 1982, Knight and others 1985). As succession advances, leaf area reaches a maximum, after which accumulation of additional organic matter has little effect on the quantity of water available to plants or to nutrient outflow (Knight and others 1985). Growth of lodgepole pine, understory production, and pine reproduction are not correlated with snowpack depth or water content; but the understory shifts from graminoid dominance to forb dominance as snow depth increases (Harper and others 1980).Stands of this series are located in a high precipitation zone, but most of water leaves the soil surface soon after it appears in liquid form. The soil surface is dry year-round in these lodgepole pine sites, even when it is covered with snow.

Soils in these lodgepole-pine climax forests are generally nutrient-poor, except in the upper inch or so. The litterfall from lodgepole pine leaves is initially nutrient-poor, especially in nitrogen, and decomposition of leaf litter is slow, even under winter snowpack. Keeping the nutrients (especially nitrogen) in the upper inch of soil is very important (Fahey 1983), which may explain why surface scarification often fails to encourage regeneration.

Kaufmann and others (1982) derived equations relating total leaf area (t, m²), effective projected leaf area (e, m²), tree basal area (b, cm²), and tree dbh (d, cm), for lodgepole pine:

$$t = 0.174b = 0.137d^2$$

$$e = 0.0331b = 0.0261d^2$$

Germinating seeds in the seed bank (trees, shrubs, herbs) are very few (Whipple 1978). Seedling success varies widely by site, and may be very slightly improved by seedbed preparation (Stermitz and others 1974).

Timber Management

Tree productivity is low to moderate (Pfister and others 1977, Hess and Alexander 1986). Lodgepole pine is often the only tree on the site, so that "monoculture seems inevitable" (Pfister and others 1977). Even-aged management, by either clearcutting or shelterwood cutting, is recommended for most stands. A shelterwood system better meets wildlife cover and visual management requirements, while at the same time provides shade to conserve soil moisture and help control overstocking (Mauk and Henderson 1984).

In stands with non-serotinous cones, clearcuts should be 3- to 5-acre patches or narrow 400-foot wide strips to encourage natural regeneration. Large clearcuts require fill-in planting. In stands with serotinous cones, clearcuts up to 40 acres may be appropriate in stands with insect or disease problems. Slash must be disposed so that the seed source is not destroyed. Individual-tree or group-selection cutting can reduce the risk of mountain pine beetle epidemics by removing the most susceptible host trees, however, tree growth is reduced considerably (Hoffman and Alexander 1980, Hess and Alexander 1986, Alexander and others 1986, Komárková and others 1988).

Streamflow can be substantially increased by clearcutting about one-third of an area in small patches interspersed with uncut timber. If larger openings are cut, slash should be left in place to create surface roughness needed to retain the snowpack (Hess and Alexander 1986). Partial cutting on north slopes can also help increase streamflow, but runoff may be less than with clearcutting. Group shelterwood and group selection cutting can be nearly as favorable for water production as clearcutting if the openings are near the maximum size of 2 acres (Komárková and others 1988).

Where elk sedge is conspicuous in the understory, large clearcuts are not recommended, even when stands are infested with dwarf mistletoe or susceptible to attack by mountain pine beetle. The competition between seedlings and elk sedge may reduce tree establishment, which offsets the reduction in insect and disease losses by increasing the likelihood that large openings will be slow to regenerate (Komárková and others 1988).

Stands that are too dense (or "doghair") can occur after clearcutting, which is undesirable because growth is suppressed in these stands. Many regenerating lodgepole pine stands require thinning at some point (Mauk and Henderson 1984). Silviculturists recommend that lodgepole pine stands be thinned at about 30 years of age to achieve merchantable sawtimber at a rotation age of about 80 years (Cole and Koch 1995). Growing stock levels (GSL) of 80 to 120 are most

appropriate for timber production (Hess and Alexander 1986, Alexander and others 1986).

Changes to deer and elk habitat can occur after thinning (Austin and Urness 1982, Crouch 1986). Thinning lodgepole pine stands increases most understory species, except whortleberries (*Vaccinium*), but this produces comparatively little benefit to big game cover or forage (Crouch 1986). Benefits from thinning can be achieved if the clearing to cover ratio is designed for maximum benefit, and clearcuts are seeded to adapted species. The benefit usually lasts about 10 years, after which it declines sharply to 20 years, as the lodgepole pine canopy closes again (Urness 1985). Deer use doubles in alternate-strip clearcuts, especially in the cut strips themselves (Wallmo 1969, Wallmo and others 1972). In lodgepole pine clearcut openings, ectomycorrhizal activity drops off sharply with increasing opening width, especially > 7 m from the west edge and > 5 m from the north edge; but total root density does not change significantly (Parsons and others 1994).

Fire Management

Pure lodgepole pine stands have often been attributed to fire, yet fire is a minor factor in the current stands of lodgepole pine (Steele and others 1981-1983). Before fire suppression began in the early 20th century, most fires were low-intensity, creeping, surface fires; whereas most fires today are high-intensity crown fires that occur during severe fire weather, dry and windy (Lotan and others 1985). The stand-replacing fire interval in lodgepole pine forests is about 240-300 years. Major fire frequency in lodgepole pine forests is 5.8 per 100 km² per century; the frequency of all fires is 11.7 per 100 km² per century (Romme 1982).

Table 06-3. Six postfire seral (successional) stages in a lodgepole pine climax type which closely resembles those in the UGB (Romme 1982).

Stage	Age Range, years
1. Herbaceous	0 - 20
2. Seedling-Sapling	20 - 40
3. Immature Pine Forest	40 - 150
4. Mature Pine Forest	150 - 200
5. Transitional	170 - 300
6. Climax Forest	> 240 to > 300

Lodgepole pine trees (and sometimes whole stands) are classified by their cones as either *serotinous* (closed-cone) or *non-serotinous*. Serotinous cones are opened only by hot fire, so in serotinous trees or stands, regeneration following cutting will likely fail, whereas stands where most of the trees are non-serotinous will regenerate after cutting. Asymmetrical cones and an acute angle of attachment to the branch are reliable indicators of serotiny (Tinker and others 1994).

Closed stands of lodgepole pine in the UGB probably arose quickly after hot, stand-replacing crown fires. In contrast, more open stands probably arose through a combination of low stocking following stand-replacing fires or many less-intense fires, perhaps reinforced by dwarf mistletoe (*Arceuthobium americanum*) infestation, allowing more or less continuous recruitment over the last 120-140 years (Parker and Parker 1994).

Prefire density of serotinous trees is an important indicator of postfire seedling density, more important than aspect, slope, soil type, or fire frequency (Muir and Lotan 1985, Tinker and others 1994). In many pure lodgepole pine stands, cones are non-serotinous, so it is unlikely that they are maintained by frequent fire (Steele and others 1983, Mauk and Henderson 1984.

Range Management

Forage production is typically low to very low, and livestock use these stands little except for shade where the stands are adjacent to open rangelands. Under the dense canopy of lodgepole pine, the stands are biologically sparse and inherently undiverse. Stands are usually only lightly used by elk, deer, and other big game, for cover in summer. Forage and browse is typically sparse, but may be attractive to deer if palatable shrubs are evident (such as buffaloberry). Birds and small mammals are typically sparse (Urness 1985). Hiding cover requirements for elk are met in lodgepole pine stands when the sum of dbh is > 5,000 in/ac (Smith and Long 1987).

Closed-canopy stands of the same cold, dry lodgepole pine type found in the UGB occur in a low-elevation bighorn sheep summer-lambing range west of Saguache near the UGB. These stands are not used by bighorn, and very little by other big game (Shepherd 1975). Porcupine damage can be significant in some areas (Mauk and Henderson 1984).

Recreation, Roads & Trails, Scenery

Stands of this series are suitable for roads and trails where the slope angle is shallow. Since much of the soil is made up of gravel, cut banks must be at a lower angle than elsewhere. Sites are moderately stable, and suitable for dispersed camping, but they are rarely preferred because of lack of water and conspicuous gravel on surface. Such sites are moderately suitable for developed recreation where the slope angle is shallow. Scenic value of these stands is moderate, as they are pretty monotonous (Steele and others 1983). Revegetation is slow and difficult, due to infertile, gravelly soils, cold sites, and short growing seasons (Cole 1982).

A lodgepole pine/Rocky Mountain whortleberry stand (Community Type A) in the central part of the Upper Gunnison Basin. Lodgepole pine 62% cover, aspen 45%, Rocky Mountain whortleberry 31%, elk sedge 28%. Coarse Fragments Cover = 2%, Total Live Cover = 233%, Coarse Fragments in Soil = 54. Pitkin Quadrangle, elevation 10,240 ft, 29% 063° (ENE) slope. August 24, 1994.

The soil profile associated with the stand in the photo to the left. Red because the soil is derived from the Maroon Formation. This soil is a Typic Cryoboralf, Loamy-Skeletal, Mixed. August 24, 1994.

Table 06-4. Climate and Soils

Characteristic	Value	Reference
Precipitation zone	590 mm/yr (410-900 mm/yr) 23 in/yr (16-35 in/yr)	Steele and others 1983, Knight and others 1985
Depth of Litter <3 cm Diameter In Undisturbed PICO Forests	average 2.6 cm	DeByle 1980
Weight of Litter <3 cm Diameter In Undisturbed PICO Forests	average 30,000-40,000 kg/ha	
Soil pH to 15 cm depth	5.2 (4.5-6.3)	

Key to Ecological Types in the Lodgepole Pine Series

1. TLC = Total Live Cover

1. TLC[1] <100%. Understory sparse to very sparse..... (2)
1. TLC[1] >100%. Understory with at least one species >15% cover..... (3)

2. Silvertop sedge present and >3% cover. Glacial moraines derived from granite. Soil with <30% coarse fragments below the surface.....FD17
2. Silvertop sedge usually absent. Colluvial or residual slopes, not glacial. TLC[1] <85% FD19

3. Silvertop sedge present and >3% cover. Glacial moraines derived from granite. Soil with <30% coarse fragments below the surface.....FD17
3. Silvertop sedge usually absent. Rocky Mountain whortleberry (VAMYO) prominent and >10% cover, often >20%. Soil with >35% coarse fragments below the surface. Colluvial or residual (not glacial) slopes..... .....FD18

Table 06-5. Characteristics of Ecological Types within Ecological Series 6 in the Upper Gunnison Basin. Numbers are shown in form *Average (Minimum-Maximum).*

Code and Short Name	No. Samples	Elevation, ft	Avg. Aspect, °M (r) Slope, %	Soil Coarse, %	Depth, cm Mollic, cm	Surface: Coarse, % Bare, %	Cover, %: Trees Shrubs Graminoids Forbs	Total Live Cover, % No. Species TLC/NS, %
FD17 Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial	3	10,197 (9,930-10,730)	58 (0.34) 21 (16-29)	23 (16-30)	106 (71-124) 6 (2-15)	2 35	65 (22-91) 1 (0-2) 38 (5-73) 9 (0-26)	112.5 (86.9-128.1) 22 (14-32) 5.6 (3.8-6.7)
FD18 Lodgepole pine/whortleberry—Cold light-colored soils	13	10,063 (9,350-10,600)	52 (0.31) 15 (5-29)	49 (39-60)	159 (43-275) 5 (0-10)	1 (1-2) 2 (1-35)	75 (40-107) 61 (26-116) 19 (0-61) 25 (1-62)	179.2 (96.0-278.0) 13 (5-25) 15.8 (8.9-25.1)
FD19 Lodgepole pine/sparse	8	*	* *	*	* *	* *	48 (30-60) 11 (2-26) 1 (0-5) 4 (1-15)	63.6 (46.0-81.0) 7 (4-11) 10.0 (4.6-13.5)

*. Not sampled.

LODGEPOLE PINE/SILVERTOP SEDGE–COLD LIGHT-COLORED SOILS–GLACIAL

Lodgepole pine/silvertop sedge--Cold Cryoboralfs—Glacial granitic slopes, 9,930-10,730 ft

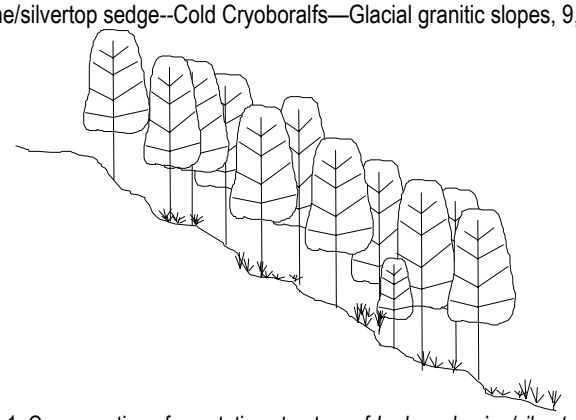

Figure 06-1. Cross-section of vegetation structure of *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial*. Aspects are northerly, and slope angles average 21%.

Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial is a common type on glacial moraines and other glacial surfaces, on cold soils, in the unique, very cold, partial rainshadow climate of Taylor Park. This type is found on Subalpine glacial hills around the edges of Taylor Park (northeast part of the UGB), and is apparently known only from here. *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial* is characterized by lodgepole pine (PICO), silvertop sedge (CAFO3), and Virginia strawberry (FRVI). Engelmann spruce (PIEN) is often present in small, non-reproducing populations. Granite-derived glacial hills are a distinguishing feature of this type. See Table 06-9 for common species names and codes.

Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial stands typically have a tall, nearly closed canopy of lodgepole pine with a sparse understory. The only conspicuous and constant species in the understory is silvertop sedge, an indicator for this shaded, well-drained environment. *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial* is distantly related to *Lodgepole pine/sparse*, which has an even sparser understory, and occurs on non-glacial surfaces. The plant association of this type is *Pinus contorta/Carex foenea,* which is described as new here. Lodgepole pine-buffaloberry communities adjoin this type on dryer slopes at higher elevations. Mountain big sagebrush/Idaho fescue communities occur in parks at lower elevations. Tall (blue) or more commonly short (planeleaf, Wolf's) willow riparian communities border this type along creeks.

Horizontal obstruction has not yet been measured in this type, though it is likely to be low to moderately low. Deer and elk do not use these sites except for transition during spring through fall, due to low obstruction values and lack of browse and forage. They are completely inaccessible during any winter.

Table 06-6. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial*.

	Mule Deer	Elk
CT	Season–Preference	Season–Preference
A	Winter, Any– Very Low Spring/Fall– Low (Transition)	Winter, Any– Very Low Spring/Fall– Low (Transition)

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NUMBER OF SAMPLES	3, soil descriptions from 1 of these (total 3)
ELEVATION	10,197 ft (9,930-10,730 ft); 3,108 m (3,027-3,270 m)
AVERAGE ASPECT	58°M (r = 0.34)
LITHOLOGY	All granite
FORMATIONS[1]	Xg
LANDFORMS	Glacial outwash [63%] or moraines [25%]
SLOPE POSITIONS	Footslopes
SLOPE SHAPES	Undulating both horizontally and vertically
SLOPE ANGLE	20.9% (16-29%)
SOIL PARENT MATERIAL	Primarily glacial [88%]
COARSE FRAGMENTS	0.7% (0-2%) cover on surface, 22.9% (16-30%) by volume in soil
SOIL DEPTH	106 cm (71-124 cm); 41.9 in (28-49 in)
MOLLIC THICKNESS	6 cm (2-15 cm); 2.5 in (1-6 in)
TEXTURE	Sandy clay loam surface, loamy sand subsurface
SOIL CLASSIFICATION	Cryoboralfs [86%] or Cryochrepts
TOTAL LIVE COVER	112.5% (86.9-128.1%)
NUMBER OF SPECIES	21.7 (14-32)
TOTAL LIVE COVER/NO. SPECIES	5.6% (3.8-6.7%)
CLIMATE	The bottom of Taylor Park is an area of pronounced cold air drainage year-round, and gets significant winter snowfall, yet is in a partial rainshadow in the growing season. Cold, moderately dry forest.
WATER	The soil surface retains minimal moisture because of litter and duff.

Community Type Description

A *Lodgepole pine-silvertop sedge* Lodgepole pine dominates a dense to sparse layer of silvertop sedge. Other than these two species, the stand is sparse to very sparse. The only other constant is Virginia strawberry.

Table 06-7. Community types within *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial*.

Community Type	No. samples	Elevation, ft Slope, %	Coarse, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Lyr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Obstruction %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Lodgepole pine-silvertop sedge	3	10,197 (9,930-10,730) 20.9 (16-29)	23 (16-30) 106 (71-124) 6 (2-15)	2 35 LS	T1 T2 T3 S GF M L	25 (18-27) 12 (1.2-18) 0.4 (0.0-2.0) 0.2 (0.0-0.5) 0.3 (0.0-0.6) 0.0 0.0	85.8 13.4 T T 19.6 0.6 T	65 (22-91) 1 (0-2) 38 (5-73) 9 (0-26)	22 (14-32) 113 (87-128) 5.6 (3.8-6.7)	*

*. Unknown: measurements were not taken in this CT.

Table 06-8. Resource Values for *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial*. Resource values were calculated from the numbers in Table 06-7, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type		Community Type
Resource Value	**A**	**Resource Value**	**A**
Potential Cattle Forage Production	1	Deer & Elk Hiding Cover	2-3
Grazing Suitability	0	Deer & Elk Forage & Browse	0-1
Potential Timber Production	4-5	Need for Watershed Protection	2
Timber Suitability	4-5	Soil Stability	4
Developed Recreation	2-3	Risk of Soil Loss-Natural	2
Dispersed Recreation	1-2	Risk of Soil Loss-Management	2
Scenic	1-2	Risk of Permanent Depletion-Range	0
Road & Trail Stability	3-4	Risk of Permanent Depletion-Wildlife	1
Construction Suitability	3		

An unusual type, lodgepole pine/silvertop sedge (Community Type A) on a glacial surface in upper Taylor Park. Lodgepole pine 91% cover, silvertop sedge 29% (very nearly the only two species). Coarse Fragments Cover = 0%, Total Live Cover = 128%, Coarse Fragments in Soil = 16. Soil sampled as an Entic (or Typic) Cryumbrept, Sandy-Skeletal, Mixed. Italian Creek Quadrangle, elevation 9,930 ft, 16% 051° (NE) slope. September 8, 1993.

Table 06-9. Common Species in *Lodgepole pine/silvertop sedge–Cold light-colored soils–Glacial*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

Code	Species	C. T. A Ccv(Con) N = 3	Common Name
	TREES		
PIEN	Picea engelmannii	1 (100)	Engelmann spruce
PICO	Pinus contorta	64 (100)	lodgepole pine
	SHRUBS		
RIIN2	Ribes inerme	T (67)	whitestem currant
RUID	Rubus idaeus	T (33)	American red raspberry
VACE	Vaccinium cespitosum	2 (33)	dwarf bilberry
	GRAMINOIDS		
AGSC5	Agrostis scabra	2 (33)	rough bentgrass
CABR11	Carex brevipes	2 (33)	sedge
CAFO3	Carex foenea	31 (100)	silvertop sedge
ELEL5	Elymus elymoides	T (33)	bottlebrush squirreltail
FEBRC	Festuca brachyphylla ssp. coloradensis	2 (33)	alpine fescue
KOMA	Koeleria macrantha	2 (33)	prairie junegrass
POFE	Poa fendleriana	T (33)	muttongrass
PONE2	Poa nervosa	4 (33)	Wheeler bluegrass
POPR	Poa pratensis	8 (33)	Kentucky bluegrass
TRSP2	Trisetum spicatum	1 (67)	spike trisetum
	FORBS		
ACLA5	Achillea lanulosa	6 (33)	western yarrow
ANSE4	Androsace septentrionalis	T (33)	northern rock-jasmine
ANRO2	Antennaria rosea	1 (33)	rose pussytoes
BORE6	Boechera retrofracta	1 (33)	false-arabis
CAOC4	Castilleja occidentalis	2 (33)	paintbrush
ERSI3	Erigeron simplex	1 (33)	one-stemmed fleabane
FRVI	Fragaria virginiana	1 (100)	Virginia strawberry
GASE6	Galium septentrionale	T (33)	northern bedstraw
GADR3	Gastrolychnis drummondii	1 (33)	alpine campion
GEAC2	Gentianella acuta	1 (33)	little gentian
LIIN2	Lithospermum incisum	T (33)	puccoon
NOMO2	Noccaea montana	2 (33)	candytuft
PNAF	Pneumonanthe affinis	1 (33)	bottle gentian
POEF	Potentilla effusa	T (67)	Saskatchewan cinquefoil
PUPA5	Pulsatilla patens	1 (33)	American pasque flower
SOMU	Solidago multiradiata	T (33)	mountain goldenrod
SOSI3	Solidago simplex	2 (33)	Mt. Albert goldenrod
STLO2	Stellaria longipes	T (33)	long-stalked stitchwort
STUM	Stellaria umbellata	1 (33)	umbellate starwort
TAOF	Taraxacum officinale	T (33)	common dandelion
VAED	Valeriana edulis	4 (33)	edible valerian
VIAD	Viola adunca	1 (33)	hook violet
	GROUND COVER		
.BARESO	bare soil	35 (33)	
.LITTER	litter and duff	85 (100)	
GRAVEL	gravel 0.2-10 cm	–	
.COBBLE	cobble 10-25 cm	– –	
.STONES	stone > 25 cm	– –	
.MOSSON	moss on soil	1 (67)	
LICHENS	lichens on soil	4	

Lodgepole pine/Rocky Mountain whortleberry–Cryoboralfs—
Gentle to moderately steep slopes, 9,300-10,600 ft

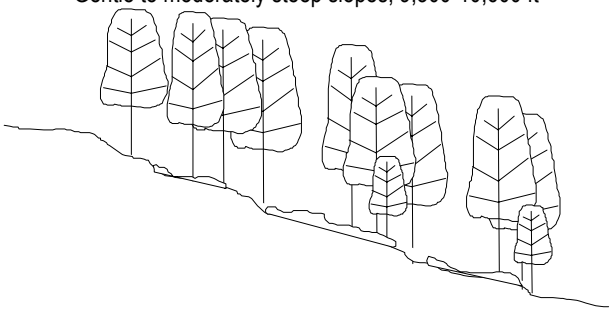

Figure 06-2. Cross-section of vegetation structure of *Lodgepole pine/whortleberry–Cold light-colored soils*. Aspects are northerly, and slope angles average 15%.

Lodgepole pine/whortleberry–Cold light-colored soils is a moderately common type on cold (Cryic), exposed, well-drained slopes in the Subalpine, outside the deep rainshadows. In the Gunnison Basin, this type is found on dry, cold, northeasterly Subalpine slopes. This type has also been described from northern Colorado. *Lodgepole pine/whortleberry–Cold light-colored soils* is characterized by lodgepole pine (PICO) and Rocky Mountain whortleberry (VAMYO). See Table 06-13 for common species names and codes.

Lodgepole pine/whortleberry–Cold light-colored soils is related to *Fir-spruce/whortleberry–Cold light-colored soils*, which occurs at higher elevations on shallower soils, and has conspicuous subalpine fir and Engelmann spruce. This type is the *Pinus contorta/Vaccinium myrtillus* ssp. *oreophilum* plant association of Johnston (1987), based on a description in Moir (1969). *Lodgepole pine/whortleberry–Cold light-colored soils* typically occurs as tall to medium-height stands of lodgepole pine, sometimes mixed with aspen (POTR5). The understory is dominated by Rocky Mountain whortleberry, usually in abundance, which is sometimes broken up by a few medium shrubs, such as common juniper (JUCO6). This type is adjoined by spruce-fir/whortleberry communities on less well-drained, less exposed slopes.

Horizontal obstruction varies from moderately low to moderately high. Hiding cover is moderate at best, and there is little browse or forage in these stands, so they are used moderately by elk and deer mainly for transition during spring through fall The sites are inaccessible to big game during the winter due to heavy snow accumulation.

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic

NUMBER OF SAMPLES	13, soil descriptions from 2 of these (total 13)
ELEVATION	10,063 ft (9,350-10,600 ft); 3,067 m (2,850-3,231 m)
AVERAGE ASPECT	52°M (r = 0.31)
LITHOLOGY	A variety, mostly igneous (granite-schist-tuff-andesite)
FORMATIONS[1]	A variety
LANDFORMS	Soil creep slopes and mesas
SLOPE POSITIONS	Backslopes and shoulders
SLOPE SHAPES	Linear to convex both horizontally vertically
SLOPE ANGLE	15.1% (5-29%)
SOIL PARENT MATERIAL	Colluvium or residuum
COARSE FRAGMENTS	0.8% (0-2%) cover on surface, 49.2% (39-60%) by volume in soil
SOIL DEPTH	159 cm (43-275 cm); 62.6 in (17-108 in)
MOLLIC THICKNESS	5 cm (0-10 cm); 2.0 in (0-4 in)
TEXTURE	Clay, sandy loam surface; sandy clay loam, clay loam, sandy clay subsurface
SOIL CLASSIFICATION	Cryoboralfs
TOTAL LIVE COVER	179.2% (96.0-278.0%)
NUMBER OF SPECIES	12.6 (5-25)
TOTAL LIVE COVER/NO. SPECIES	15.8% (8.9-25.1%)
CLIMATE	Cold, well-drained slopes, often in partial rainshadow. Cold, moderately dry forest.
WATER	The soil surface is dry year-round, even under snow. A little moisture is retained by the litter and duff.

Table 06-10. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Lodgepole pine/whortleberry–Cold light-colored soils*.		
CT	Mule Deer Season–Preference	Elk Season–Preference
A	Winter, Any– Very Low Spring/Fall– Moderate (Transition)	Winter, Any– Very Low Spring/Fall– Moderate (Transition)
B	Winter, Any– Very Low Spring/Fall– Moderately Low (Transition)	Winter, Any– Very Low Spring/Fall– Moderately Low (Transition)

Key to Community Types

1. Aspen codominant with lodgepole pine. Aspen >15% cover ..... **A**
1. Aspen absent or <10% ..... **B**

Description of Community Types

A *Lodgepole pine-aspen-Rocky Mountain whortleberry-elk sedge* Lodgepole pine is dominant, with >50% cover. Aspen is codominant or subdominant with >15% cover.

B *Lodgepole pine-Rocky Mountain whortleberry* Lodgepole pine is dominant, with >40% cover. Aspen is absent or rarely <10% cover.

Table 06-11. Community types within *Lodgepole pine/whortleberry–Cold light-colored soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarse, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Lyr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Obstruction %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Lodgepole pine-aspen-Rocky Mtn. whortleberry-elk sedge	4	10,420 (10,240-10,600) 20.0 (11-29)	49 (39-60) 159 (43-275) 5 (0-10)	2 2 (2-35) LS	T1 T2 T3 T4 S1 S2 GF M	21 (17-24) 13 (5-15) 5 (2.0-7) 0.7 (0.2-1.2) 0.6 (0.3-0.9) 0.2 (0.0-0.3) 0.2 (0.0-1.1) 0.0	37.5 52.1 1.8 T T 50.8 55.2 1.6	86 (66-107) 61 (46-96) 43 (30-61) 33 (20-55)	18 (9-25) 223 (175-278) 13.8 (8.9-19.4)	30 (10-50) 40 (25-55) 40 (20-60) 68 (60-75) 44 (29-60)
B. Lodgepole pine-Rocky Mtn. whortleberry	9	9,350 5	* * *	1 1 LM	*			70 (40-91) 61 (26-116) 8 (0-30) 21 (1-62)	10 (5-16) 160 (96-222) 16.7 (11.7-25.1)	*

*. Unknown: measurements were not taken in this CT.

Table 06-12. Resource Values for *Lodgepole pine/whortleberry–Cold light-colored soils*. Resource values were calculated from the numbers in Table 01-4, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type				Community Type	
Resource Value	**A**	**B**		**Resource Value**	**A**	**B**
Potential Cattle Forage Production	2-3	1-2		Deer & Elk Forage & Browse	2	1
Grazing Suitability	1	0		Need for Watershed Protection	2	1
Potential Timber Production	2-3	1-2		Soil Stability	3	3-4
Timber Suitability	3	2		Risk of Soil Loss-Natural	3	2
Developed Recreation	2	1		Risk of Soil Loss-Management	2	1
Dispersed Recreation	3	2		Risk of Permanent Depletion-Range	1	0
Scenic	2	1		Risk of Permanent Depletion-Wildlife	1	0
Road & Trail Stability	3-4	4		Risk of Permanent Depletion-Timber	4	3
Construction Suitability	3	3		Resource Cost of Management	4	3
Deer & Elk Hiding Cover	3-4	2-3		Cost of Rehabilitation	1	1

Table 06-13. Common Species in *Lodgepole pine/whortleberry–Cold light-colored soils*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

	Community Type	A	B	
		Ccv (Con)	Ccv (Con)	
Code	Species	N = 4	9	Common Name
	TREES			
PICO	Pinus contorta	52 (100)	69 (100)	lodgepole pine
POTR5	Populus tremuloides	33 (100)	5 (22)	quaking aspen
	SHRUBS			
ARUV	Arctostaphylos uva-ursi	15 (50)	11 (56)	kinnikinnick
JUCO6	Juniperus communis	6 (100)	7 (89)	common juniper
MARE11	Mahonia repens	3 (50)	5 (56)	Oregon-grape
ROWO	Rosa woodsii	7 (75)	13 (44)	Woods rose
SHCA	Shepherdia canadensis	– –	1 (44)	russet buffaloberry
VAMYO	Vaccinium myrtillus ssp. oreophilum	40 (100)	39 (100)	Rocky Mountain whortleberry
	GRAMINOIDS			
BRCA10	Bromopsis canadensis	3 (75)	– –	fringed brome
CAGE2	Carex geyeri	39 (100)	12 (56)	elk sedge
CARO5	Carex rossii	– –	2 (44)	Ross sedge
	FORBS			
ARCO9	Arnica cordifolia	10 (100)	11 (67)	heartleaf arnica
ARLA8	Arnica latifolia	– –	25 (11)	broadleaf arnica
CHDA2	Chamerion danielsii	T (25)	3 (22)	fireweed
FRVI	Fragaria virginiana	6 (25)	20 (11)	Virginia strawberry
LUAR3	Lupinus argenteus	12 (100)	30 (11)	silvery lupine
SOSI3	Solidago simplex	20 (25)	2 (33)	Mt. Albert goldenrod
THMO6	Thermopsis montana	– –	25 (11)	golden banner
	GROUND COVER			
.BARESO	bare soil	2 (25)	1 (11)	
.LITTER	litter and duff	96 (50)	98 (11)	
GRAVEL	gravel 0.2-10 cm	–	–	
.COBBLE	cobble 10-25 cm	– –	– –	
.STONES	stone > 25 cm	2 (25)	– –	
.MOSSON	moss on soil	3 (25)	– –	
LICHENS	lichens on soil	–	4	

A lodgepole pine/Rocky Mountain whortleberry stand (Community Type A). Lodgepole pine 58%, aspen 42%, Rocky Mountain whortleberry 40%, elk sedge 39%. Coarse Fragments Cover = 0%, Total Live Cover = 215%, Coarse Fragments in Soil = 43. Soil sampled as a Lithic Cryochrept, Fine-Loamy. Almont Quadrangle, elevation 10,600 ft, 11% 034° (NNE) slope. July 11, 1994.

Lodgepole pine/sparse

Lodgepole pine/sparse--Cryoboralfs-Slopes

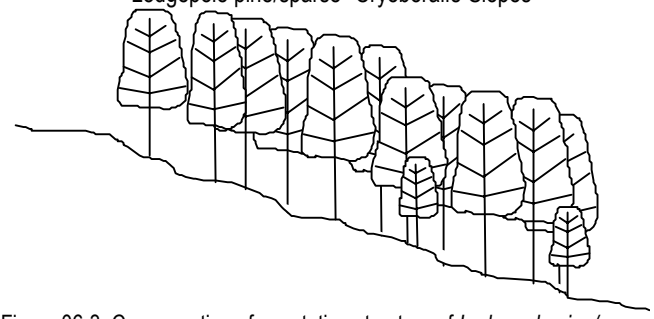

Figure 06-3. Cross-section of vegetation structure of *Lodgepole pine/sparse.*

Lodgepole pine/sparse is a moderately common type on Subalpine slopes, in areas with Cryic soils, outside the deep rainshadows. In the Gunnison Basin, this type is found on Subalpine slopes outside the deep rainshadow. Its more widespread distribution is uncertain. *Lodgepole pine/sparse* is characterized by lodgepole pine (PICO) and sparse understories. See Table 06-16 for common species names and codes. The plant association *Pinus contorta/*sparse is described as new here.

Lodgepole pine/sparse is typically a moderately dense to moderately sparse stand of lodgepole pine with no other tree species, and a sparse to very sparse understory. Total live cover is always <85%, often <75%. Total graminoid cover is <10%, and total forb cover is <20%. There are typically fewer than 10 vascular plant species in a stand. Deer and elk use these stands very little, and then only as transitional range. The stands are always inaccessible in the winter due to snow accumulation.

Summary of Ecological Type Characteristics

NUMBER OF SAMPLES	8, soil descriptions from none of these (total 8)
TOTAL LIVE COVER	63.6% (46.0-81.0%)
NUMBER OF SPECIES	6.9 (4-11)
TOTAL LIVE COVER/NO. SPECIES	10.0% (4.6-13.5%)
CLIMATE	Cold and dry
WATER	Very little water accumulates in these stands, either in the soil or on the surface. The surface is probably dry year-round, even when it is under snow.

Key to Community Types

1. Kinnikinnick (aruv) present and >1%. Oregon-grape (mare11) sometimes absent ..... **B**
1. Kinnikinnick absent. Oregon-grape always present, T-10% ..... **A**

Description of Community Types

A *Lodgepole pine-sparse Oregon-grape* has Oregon-grape >5%.
B *Lodgepole pine-sparse* has kinnikinnick >1%.

Table 06-14. Community types within *Lodgepole pine/sparse*. No measurements have been made yet of obstruction, layers, or soils in this ecological type.

Community Type	No. samples	Elevation, ft Slope, %	Surface Coarse, % Bare, % Seral Stage	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %
A. Lodgepole pine-sparse Oregon-grape	3	* *	* * LS	47 (30-55) 16 (11-26) 3 (1-5) 10 (5-15)	8 (6-11) 75 (72-81) 10.1 (6.6-13.5)
B. Lodgepole pine-sparse	5	* *	* * MS	48 (35-60) 7 (2-16) 1 (0-2) 1 (1-2)	6 (4-10) 57 (46-67) 10.0 (4.6-12.3)

*. Unknown: measurements were not taken in this CT.

Table 06-15. Resource Values for *Lodgepole pine/sparse*. Resource values were calculated from the numbers in Table 06-14, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type	
Resource Value	**A**	**B**
Potential Cattle Forage Production	1	0-1
Grazing Suitability	0	0
Potential Timber Production	2	1-2
Timber Suitability	2	2
Developed Recreation	1	1
Dispersed Recreation	1	1
Scenic	1	1
Road & Trail Stability	3	3
Construction Suitability	2	2
Deer & Elk Hiding Cover	2-3	2-3
Deer & Elk Forage & Browse	0	0
Need for Watershed Protection	1	1
Soil Stability	4	4
Risk of Soil Loss-Natural	2	2
Risk of Soil Loss-Management	1-2	1-2
Risk of Permanent Depletion-Range	0	0
Risk of Permanent Depletion-Wildlife	0	0
Risk of Permanent Depletion-Timber	1	1
Resource Cost of Management	2	2
Cost of Rehabilitation	1	1

Table 06-16. Common Species in *Lodgepole pine/sparse*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Ground cover was not recorded in these plots. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

		COMMUNITY TYPE A	COMMUNITY TYPE B	
Code	Species	Ccv(Con) N = 3	Ccv(Con) 5	Common Name
	TREES			
PICO	Pinus contorta	47 (100)	48 (100)	lodgepole pine
	SHRUBS			
ARUV	Arctostaphylos uva-ursi	5 (33)	3 (40)	kinnikinnick
JUCO6	Juniperus communis	3 (67)	1 (60)	common juniper
MARE11	Mahonia repens	8 (100)	4 (80)	Oregon-grape
ROWO	Rosa woodsii	6 (67)	2 (60)	Woods rose
VAMYO	Vaccinium myrtillus ssp. oreophilum	– –	3 (40)	Rocky Mountain whortleberry
	GRAMINOIDS			
CAGE2	Carex geyeri	3 (67)	1 (40)	elk sedge
CARO5	Carex rossii	1 (67)	1 (20)	Ross sedge
	FORBS			
ARCO9	Arnica cordifolia	10 (33)	1 (40)	heartleaf arnica
CHDA2	Chamerion danielsii	1 (33)	1 (60)	fireweed
LUAR3	Lupinus argenteus	15 (33)	– –	silvery lupine
SOSI3	Solidago simplex	1 (33)	1 (20)	Mt. Albert goldenrod